MUNICIPAL AND INDUSTRIAL
WATER SUPPLY AND USES
in the
COLUMBIA AND GREAT SALT LAKE DESERT BASINS

(Data Collected for Calendar Year 1996)

Prepared by

Utah Department of Natural Resources
Division of Water Resources

JULY 1998
(Revised December 2000)

ACKNOWLEDGMENTS

This water study was conducted under the direction of Paul L. Gillette, deputy director, and supervised by Lloyd H. Austin, chief, Resource Inventories and Special Studies Section, Utah State Division of Water Resources. Staff members assisting in the preparation of this report and/or in the data collection and analysis were Eric K. Klotz and David G. Peterson. Appreciation is expressed to the various water suppliers and the Division of Water Rights for supplying information for this report.

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D. Larry Anderson, Director

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EXECUTIVE SUMMARY

This document describes the municipal and industrial (M&I) water supplies and uses for the Columbia and Great Salt Lake Desert Basins. Since there are no community systems, non-community systems or self-supplied industries in the Columbia Basin the bulk of this report is devoted to the Great Salt Lake Desert Basin (Private domestic systems for the Columbia basin are considered in the discussion of Box Elder County). The Great Salt Lake Desert basin spans all or part of nine counties: Beaver, Box Elder, Davis, Iron, Juab, Millard, Salt Lake, Tooele and Weber. However, total M&I water supplies and uses for the basin are computed by tabulating the results of only the four counties that claim any M&I water use. These counties include portions of Box Elder, Juab, Millard and Tooele. County data are compiled by meeting and surveying each public community and non-community system. The results reported herein represent totals for the 1996 calendar year.

The maximum annual potable water supply under present conditions for Public Community Systems in the basin is 25,828 acre-feet. Springs account for 21 percent while wells make up 79 percent of this total. The reliable system source capacity for these systems is 12,188 acre-feet. Table I presents this data.

TABLE I
COLUMBIA AND GREAT SALT LAKE DESERT BASINS
Maximum Culinary Water Supplies for Public Community Systems
(Units in Acre-Feet)

Source	Box Elder County	Juab County	Millard County	Tooele County	Total
Springs	116.1	0.0	0.0	5,291.1	5,407.2
Wells	851.4	15.0	322.6	19,232.0	20,421.0
Surface	0.0	0.0	0.0	0.0	0.0
TOTALS	967.5	15.0	322.6	24,523.1	25,828.2
Reliable System Source Capacity	411.8	12.9	136.8	11,626.8	12,188.2

M&I water use can be divided into two categories: potable (culinary) and non-potable (secondary). Potable water is delivered by public community, public non-community, self-supplied industrial, and private domestic systems. Non-potable uses include residential and institutional secondary water usually delivered by separate irrigation companies and secondary water used by self-supplied industries. Table II presents water use data for the potable and non-potable categories delivered by public community systems. The table shows that the residential indoor category accounts for 36 percent, residential outdoor 22 percent, commercial 5 percent, institutional 32 percent, and light industrial 5 percent of the total public community system water use (9,346 acre-feet) in the basin.

TABLE II
COLUMBIA AND GREAT SALT LAKE DESERT BASINS
Water Use for Public Community Systems
(Units in Acre-Feet)

Source	Box Elder County	Juab County	Millard County	Tooele County	Total
Potable Uses:					
Residential Indoor	65.8	12.4	9.9	3,361.0	3,449.1
Residential Outdoor	111.8	0.0	15.2	1,399.3	1,526.3
Commercial	27.9	0.0	0.3	488.8	517.0
Institutional	8.3	0.5	7.4	1,900.8	1,917.0
Industrial/Stockwater	20.5	0.0	0.4	496.4	517.3
TOTAL CULINARY	234.3	12.9	33.2	7,646.3	7,926.7
Non-Potable Uses:					
Residential	4.7	0.0	0.0	303.6	308.3
Commercial	0.0	0.0	0.0	0.0	0.0
Institutional	18.0	0.0	0.0	1,093.0	1,111.0
Industrial/Stockwater	0.0	0.0	0.0	0.0	0.0
TOTAL SECONDARY	22.7	0.0	0.0	1,396.6	1,419.3
TOTAL WATER USE	257.0	12.9	33.2	9,042.9	9,346.0

Table III presents the total M&I water use in the Great Salt Lake Desert Basin. Public community systems deliver the majority of the potable water in the basin. The table shows that the total potable M&I water use in 1996 is 22,700 acre-feet. Non-potable M&I water use for the basin is 172,385 acre-feet. This includes 170,961 acre-feet of saline water used for industrial purposes near Great Salt Lake.

Therefore, total M&I (potable and non-potable) water use in the basin is 195,083 acre-feet.

TABLE III
COLUMBIA AND GREAT SALT LAKE DESERT BASINS
Total Municipal and Industrial Water Use for all Categories
(Units in Acre-Feet)

Source	Box Elder County	Juab County	Millard County	Tooele County	Total
Potable Suppliers:					
Public Community Systems	234.3	12.9	33.2	7,646.3	7,926.7
Public Non-Community Systems	24.9	3.5	0.0	461.1	489.5
Self-Supplied Industries	699.6	0.0	0.0	13,059.1	13,758.7
Private Domestic	50.0	20.0	15.0	440.0	525.0
TOTAL CULINARY	1,008.8	36.4	48.2	21,606.5	22,699.9
Non-Potable Suppliers:					
Secondary Irrigation Companies	22.7	0.0	0.0	1,396.6	1,419.3
Non-Community Systems	0.0	0.0	0.0	3.0	3.0
Private Domestic	0.0	0.0	0.0	0.0	0.0
Self-Supplied Industries	0.0	0.0	0.0	170,961.2	170,961.2
TOTAL SECONDARY	22.7	0.0	0.0	172,360.8	172,383.5
TOTAL WATER USE	1,031.5	36.4	48.2	193,967.3	195,083.4

For 1996, population from public community systems in the West Desert Basin was 29,438. Residential potable per capita water use is 151 gallons per capita per day (gpcd). Non-potable water use amounts to 9 gpcd resulting in uses of 160 gpcd for residential purposes within the public community systems of the basin. Furthermore, by adding commercial, institutional and industrial uses, public community systems use jumps to 240 gpcd for potable uses and 43 gpcd for non-potable uses for a total of 283 gpcd. Lastly, with a population of 30,820 (including the private domestic category), the total basin M&I per capita water use including all categories and types of systems is 5,651 gpcd. The high industrial use (saline water) accounts for much of this above average value.

INTRODUCTION

Authority

The Utah Division of Water Resources has overall responsibility for completing studies, investigations, and plans directed at the responsible development and utilization of the water resources of the state of Utah. The State Water Plan, prepared and distributed in early 1990, provided the foundation and overall direction to establish and implement the state policy framework of water management. As part of the state water planning process, detailed plans are prepared for each of the state's 11 hydrologic basins. The Columbia and Great Salt Lake Desert Basins are one of these 11 reports. Each basin water plan will identify potential conservation and development projects and describe alternatives to satisfy the problems, needs, and demands. As part of this effort, background data reports are completed for each river basin. These include a water-related land use report and a water budget report.

Scope

The subject of this data report is a determination of present municipal and industrial (M&I) water supplies and uses within this basin. The data presented in these reports will be used in the State Water Plan for the Columbia and Great Salt Lake Desert Basins as well as other division reports and studies. The basin is shown in Figure 1. Information considered includes related investigations recently completed by the Division of Water Resources and the Division of Water Rights.

Data Collection

This study was begun in January 1996 by Division staff. The *1996 Municipal and Industrial Water Use Forms,* distributed by the Division of Water Rights, in cooperation with the Division of Water Resources and the Division of Drinking Water,

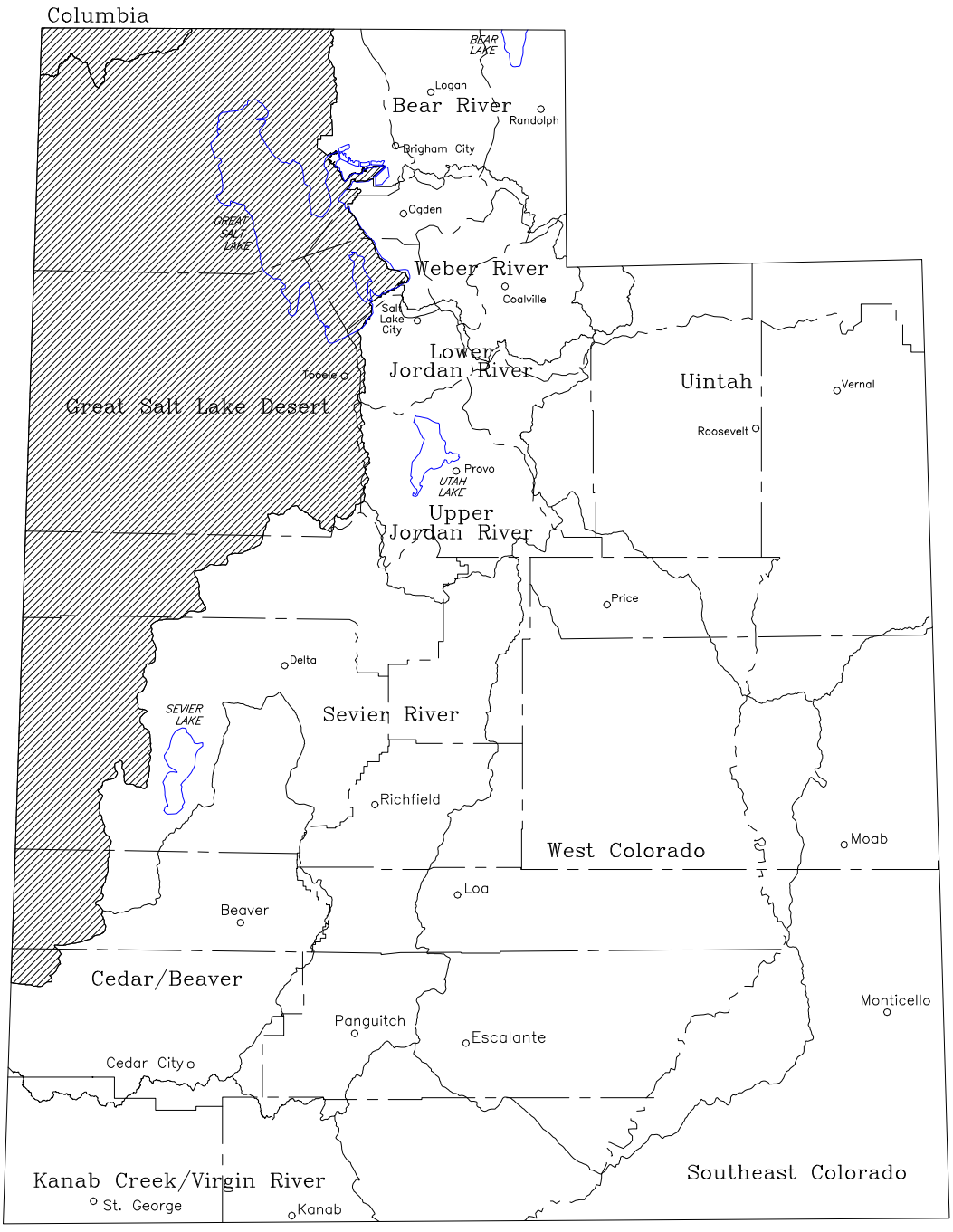


Figure 1. Location of the Great Salt Lake Desert and Columbia Basins.

were used and is the basis for the study. In all counties the data collection process is as described in the following section, *Water Supply and Use Methodology*. Water rights discussions presented herein were prepared based on conversations with Bob Fotheringham, John Mann and Kerry Carpenter, Area Engineers from the State Engineer's Office that cover the areas of the Great Salt Lake Desert Basin.

General Description of the Basin

The Great Salt Lake Desert Basin covers about 18,003 square miles of the western portion of Utah. Roughly three-fourths of the Utah/Nevada state line forms the western boundary of the basin. The crest of the Raft River Mountains coupled with the Utah/Idaho state line form the basin's northern boundary. Features such as the Promontory Mountains, Great Salt Lake, Oquirrh Mountains, Wah Wah Mountains, and other smaller mountain ranges comprise the southeastern boundary.

The basin spans all or part of nine counties: Beaver, Box Elder, Davis, Iron, Juab, Millard, Salt Lake, Tooele and Weber. This area is characterized by small north/south trending mountain ranges separated by large areas of low-lying deserts. Much of these desert areas are the previous home of ancient Lake Bonneville.

Seven study areas form the basin: Park Valley, Great Salt Lake Desert, Snake Valley, Skull Valley, Tooele-Rush Valley, Great Salt Lake, and Promontory. The basin also includes Golden Spike National Historical Site. The basin is used extensively as a military operations area. Figure 2 shows a map of the basin.

There are currently 16 public community water systems and 1 unregulated Indian system in the Great Salt Lake Desert Basin. These systems serve 29,438 people (about 95 percent of the 30,820 total population within the basin). Figure 3 locates these systems. The basin also claims 18 public non-community systems. These systems serve National Parks, State Parks, campgrounds, isolated commercial establishments, and roadside rest stops and parks.

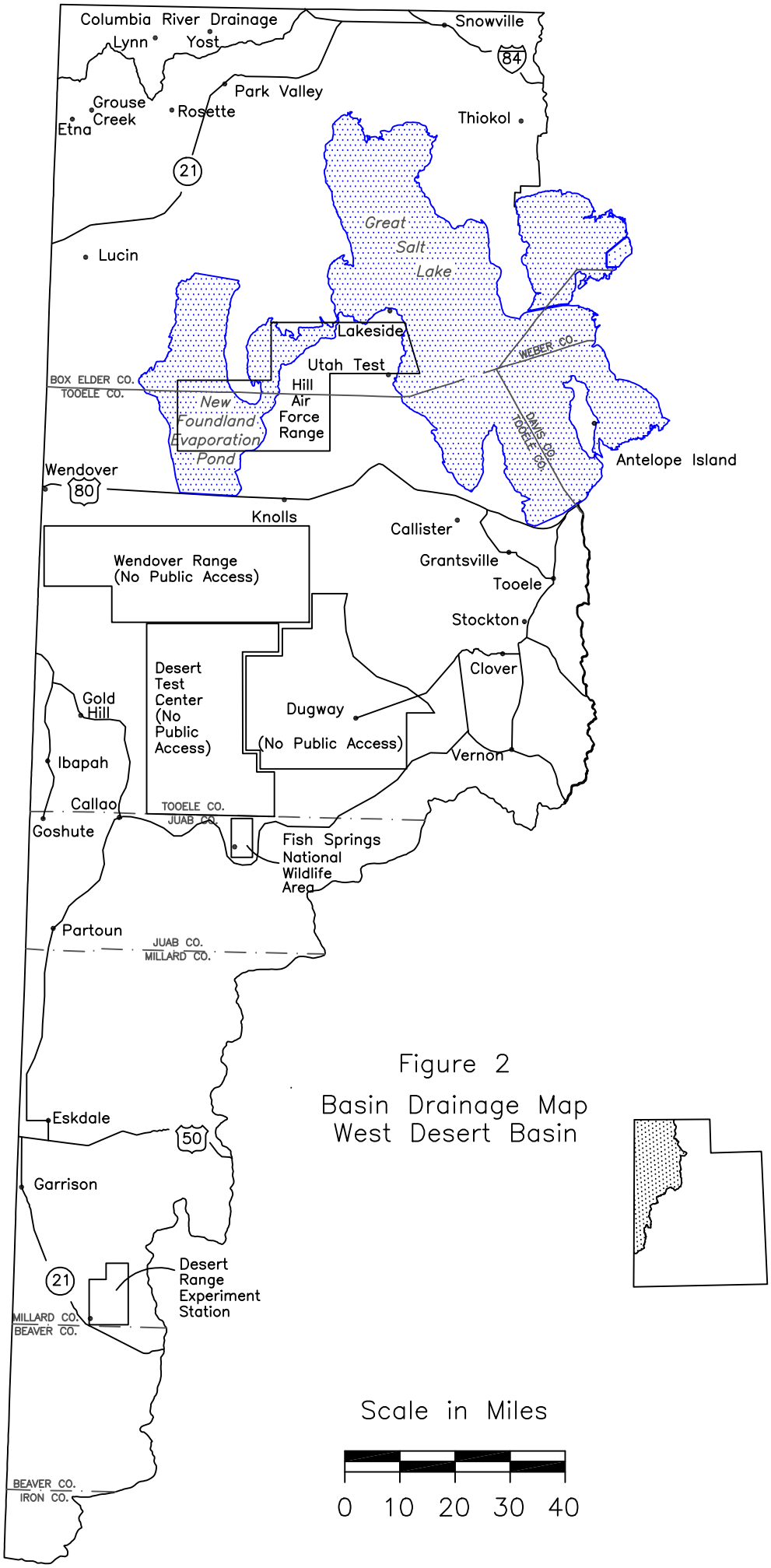
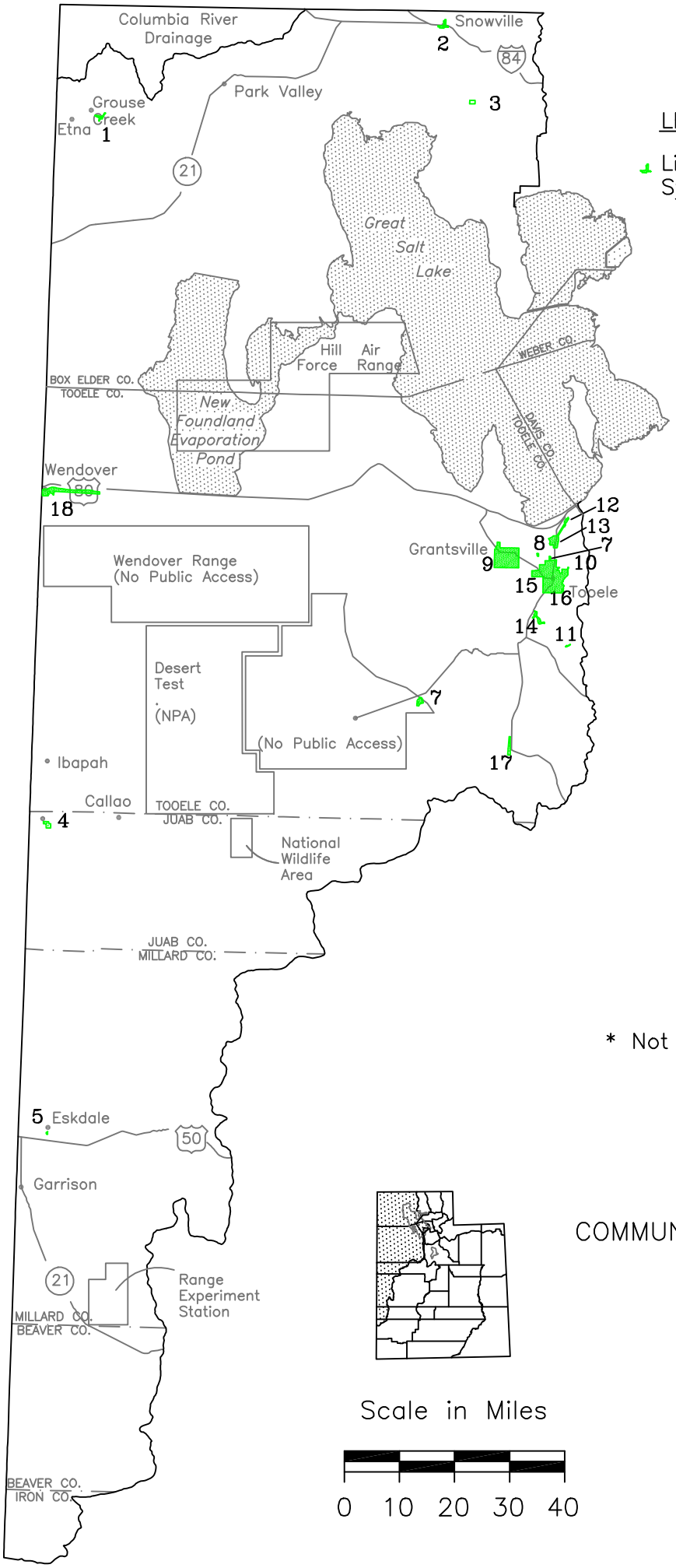


Figure 2

Basin Drainage Map
West Desert Basin



LEGEND

Limits of Public Community System Boundaries

BOX ELDER COUNTY

1 Grouse Creek
2 Snowville Waterworks Incorporated
3 Howell Water Systems

JUAB COUNTY

4 Goshute Indian Reservation*

MILLARD COUNTY

5 Eskdale

TOOELE COUNTY

6 Dugway – English Village
7 Erda Acres Water Company
8 Golden Gardens
9 Grantsville Municipal Water System
10 Lincoln Water
11 Ophir Canyon Water Association
12 S and W Trailer Park
13 Stansbury Park Improvement District
14 Stockton Municipal Water System
15 Silver Spurs Ranchos
16 Tooele Municipal Water System
17 Vernon Water Works
18 Wendover Municipal Water System

* Not regulated by State Government

Scale in Miles

0 10 20 30 40

Figure 3

COMMUNITY DRINKING WATER SYSTEMS
West Desert Basin

WATER SUPPLY AND USE METHODOLOGY

Background

Over the past 40 years the Division of Water Resources has employed various procedures to obtain needed M&I data. In recent years, these procedures have become more comprehensive. When the division began water planning in the 1960's, available data consisted mainly of supplies and uses for the entire state. At that time, agriculture uses far exceeded M&I uses in Utah. At that time M&I water use was generally calculated by using available or estimated per capita rates and multiplied by the census population data.

By the early 1980's, M&I diversions made up a larger percent of all statewide water uses and the entire water community began an increased focus on M&I water supplies and uses. The Division of Water Rights launched a program to collect yearly, statewide M&I data. The procedure involved mailing a survey designed to query each major public water supplier about their sources of water supply. In addition the United States Geological Survey (USGS) began M&I water use studies. The division relied on both of these data sources in it's planning efforts by the late 1980's.

With the preparation of the State Water Plan Basin reports, the division saw the need to check and improve the quality and quantity of the available data through two methods. The first was to join with the Division of Water Rights to improve their M&I data collection program. Secondly, the division began exploring the accuracy of the data through yearly field surveys described in the following four sections.

Present Methodology for Community Water Systems

Each year, division staff targets a particular hydrologic basin or study area for M&I water supply and use analysis. The division of Water Rights' most recent water

use form is the primary tool for these analyses. As an example, the following three pages exhibit the 1996 water use form submitted by Lincoln Culinary Water System.

Division staff contact the manager or operator of each community water system (as defined by the Division of Drinking Water) to schedule a data analysis meeting. Many times operators inadvertently omit necessary information of their yearly form. During such meetings, division staff attempts to retrieve missing data as well as obtain an overall feeling of the supplies and demands of the water system, in case estimates are necessary. Additionally, a secondary objective of these meetings is to educate the operator or manager to correctly complete the water use data form. Division staff supply a new form to those systems that either didn't receive one or didn't return one. This methodology has been used since 1994, and all of the community water systems for the various basins studied have provided the necessary M&I water supply and use data.

During the analysis, division staff determines the system's water supply and use. Two factors define water supply: 1) maximum water supply available under present conditions and 2) reliable system source capacity. The maximum water supply available under present conditions is defined as the water resource which is presently developed. The resource is limited by either a mechanical constraint (such as pump capacity or pipe size), a hydrologic constraint (such as reliable streamflow or groundwater safe yield) or a legal constraint (such as a water right or contract). The lesser amount of these three constraints is considered in this study as the maximum water supply available under present conditions. Determination of well pump capacities, spring flow estimates, treatment plant capacities, and water right information aid in the calculation of this value. It should be noted here that due to the complexity of water rights, contracts, exchanges, etc., a detailed search of water right limitations associated with each entity is not in the scope of this study.

AK =>

Information jointly requested by:
Utah Division of Water Resources, 538-7264;
Division of Drinking Water, 536-4200; and
Division of Water Rights, 538-7392.

UTAH WATER USE DATA FORM

DATA FOR 1996

Return completed form to;
Utah Division of Water Rights
1594 West North Temple
Salt Lake City, UT 84114-6300

System Name: Lincoln Culinary Water
Address: ~~1806 East Pine Canyon Road~~ ~~Tooele, UT 84074~~ 1849 N BLUEPEAK DR. LINCOLN, UT, 84074

Population Served: 400 ID #: 1162/23009
Total No. Connections: 130 County: Tooele
Average Lot Size Served: 1.0 acre(s).
Estimated Percent of Lot Irrigated 0 %.
Phone Number: (801)882-4829
Phone Number: 801-882-5739

Contact Person: Paul Kuester
Form filled out by: KEN SHIELDS

I. STORAGE INVENTORY: Total treated storage capacity: 200,000 in gallons. Number of Tanks: 1

II. SOURCE INVENTORY:

1 Source Name: Springs -3 ANGEL GROVE Type: SP Location: Sec 35, T3S, R4W, SLB&M WR Number: 15-298
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [X] Estimate, [ ] Other _____
Units of Measurement: MILLION GALLONS

NO overflow

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
0	0	0	0	.29	5.37	4.21	.25	0	0	0	0	10.12

Are there any spills/overflow? [ ] Yes, [ ] No If yes, estimate annual quantity _____. Where is source measured? [ ] Before overflow, [ ] After overflow
When do spills/overflow occur? _____ Are spills/overflow included in the quantities reported? [ ] Yes [ ] No

2 Source Name: Middle Canyon Well (8") Type: WE Location: Sec 6, T4S, R3W, SLB&M WR Number:
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [X] Estimate, [ ] Other _____
Units of Measurement: MILLION GALLONS Rated Pump Capacity: 300 [X] gpm, [ ] cfs
Date of Last Pump Test UNKNOWN ? 1988 Yield of Well _____ [ ] gpm, [ ] cfs

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
0	0	0	0	0	0	.68	1.18	1.06	.12	0	0	3.04

3 Source Name: Tooele City's Water Sys. Type: Location: Sec , T, R, SLB&M WR Number:
Method of Measurement: [X] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____
Units of Measurement: MILLION GALLONS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
0	0	0	0	0	0	0	0	0	0	0	0	0

** If you are using other sources which are not shown above, please enter the appropriate data in the space provided below. **

4 Source Name: MURRAY SPRINGS Type: Location: SEC 6 T 35 R 3W WR Number: SYSTEM # 23009 15-2307
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [X] Estimate, [ ] Other _____
Units of Measurement: MILLION GALLONS
04 UPPER SPRING
05 LOWER SPRING

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
1.62	1.44	1.25	1.73	1.56	1.45	1.02	.86	.79	.81	1.30	1.83	15.66

5 Source Name: Type: Location: WR Number:
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____
Units of Measurement: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

6 Source Name: Type: Location: WR Number:
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____
Units of Measurement: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

7 Source Name: Type: Location: WR Number:
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____
Units of Measurement: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

8 Source Name: Type: Location: WR Number:
Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____
Units of Measurement: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

SOURCE COMMENTS: Water supply conditions were: [ ] Above normal, [ ] Normal, [ ] Below normal

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III. WATER USE BREAKDOWN: (If quantities are not known, please estimate percentages. See instructions for definition of uses shown in bold.)

Units of Measurement: GALLONS

Source of data: [ ] Meter readings at the source; [X] Meter readings at individual connections; or [ ] Estimated

Residential: Annual quantity of water delivered for **residential** purposes - 21,986,660. Total number of residential connections 128.

Commercial: Annual quantity of water delivered for **commercial** purposes - 0. Total number of commercial connections 0.

Industrial: Annual quantity of water delivered for **industrial** purposes - 0. Total number of industrial connections 0.

Institutional: Annual quantity of water delivered for **institutional** purposes - 3,456,860. Total number of institutional connections 2.

Stockwatering: Annual quantity of water delivered for **stockwatering** purposes - 0. Total number of stockwatering connections 0.

Wholesale: Annual quantity of water delivered to other systems - 0. Please attach a listing of those supplied.

Other Uses: Annual quantity of water delivered for other purposes - 0. Total number of other connections 0.

Describe other uses _____

IV. IRRIGATION SYSTEM (Separate lawn and garden irrigation system, **whether controlled by the drinking water supplier or not**)

Is your area served by a separate irrigation water system? [X] Yes, [ ] No If yes, please provide the following information:

What percent of your customers are served by a separate irrigation system? UNK. % The water is delivered 100 % by ditch & _____ % by pressurized system

If system is operated by another entity, please give name of company, contact person & phone number: MIDDLE CANYON IRR. CO. ROSS JOHNSON 801-882-2335

Number of stock holders: UNK. Total shares of stock: UNK. Total acres irrigated: UNK

Please enter quantity of water delivered by the irrigation system: **Institutional acreage** _____ Quantity of water _____

Method of Measurement: [ ] Master Meter, [ ] Individual Meters, [ ] Estimate, [ ] Other _____

Units of Measurement: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

Do these quantities reflect water delivered to the municipal service area only? [ ] Yes, [ ] No If no, percent delivered to municipal service area? _____

V. ADDITIONAL INFORMATION:

Which of the following maps are available? [ ] Service area, [ ] Zoning, [ ] Distribution systems (pipes and ditches)

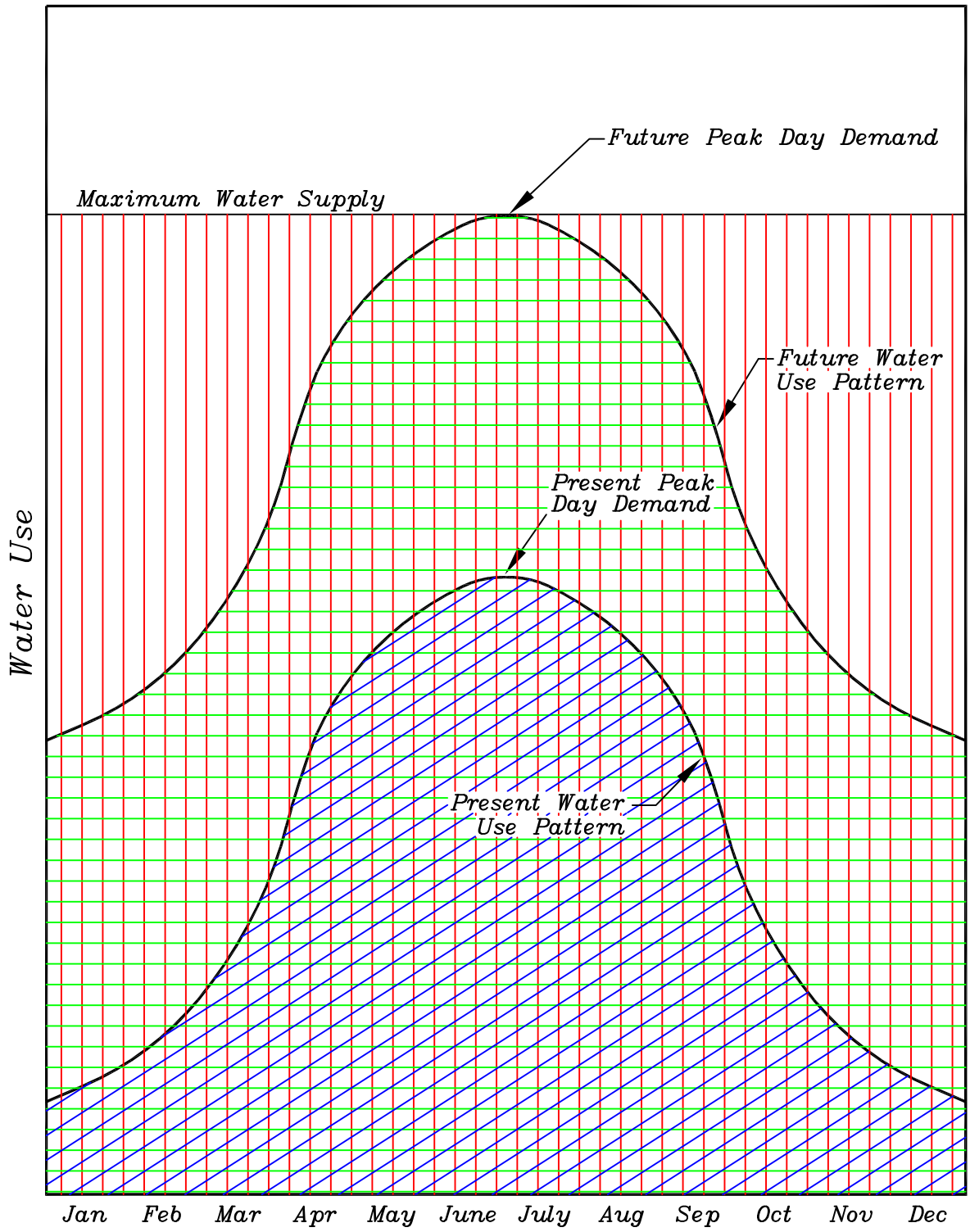
Can a listing of businesses served by the water system be provided? [ ] Yes, [ ] No

The reliable system source capacity is defined as the capacity to meet peak day demands, expressed as an annual volume. The maximum water supply available under present conditions (defined earlier) deals with an average annual volume. Many water supply components in M&I systems (treatment plants, storage facilities, pump motors, etc.) are sized using demand during a peak 24-hour period. The relationship between average day and peak day demand is important. It is for this reason that a more reliable system source capacity is determined to accurately reflect future M&I water conditions for each system. The relationship that is used is as follows:

$$P_D = - 49.4 + 2.5\ A_D$$

where P_D is peak day demand and A_D is average daily demand. For each public community system, the average per capita use (described later) is used in the relationship above to determine a peak factor, and the maximum water supply available under present conditions is used to determine a peak day supply. These two values are then used in calculating the reliable system source capacity which represents the systems' annual maximum water supply's ability to meet peak day demand conditions. It also represents the volume of water which, when divided by the average annual per capita water use, gives the population that can be reliably served by the present system sources.

Figure 4 graphically presents the relationship between maximum water supply and reliable system source capacity. Current water use is shown in the figure as the volume under the lower curve. The future water use is shown as the volume under the upper curve. The maximum water supply under present conditions is shown by the volume under the upper line. Because this amount is associated with a maximum daily flow rate (limited by the water right or system capacity), the line in the figure must pass through the peak day demand point on the future water use curve. It is for this reason (and the fact that most culinary water system storage tanks are designed to store only about one days' worth of water demand) that not all of the maximum water supply is available to meet future water needs. Therefore, the reliable system source capacity, which is equal to the volume under the future water



Present Yearly Water Use (Volume under curve)

Present Reliable System Source Capacity/Future Water Use (Volume under curve)
When this volume is divided by annual per capita water use, this yields the population that can be reliably served.

Maximum Source Capacity Available Under Present Conditions (Volume under line)

Figure 4. Water Supply and Use Hydrograph.

use curve, is a better indication for meeting future water needs. For most systems this value is about one half of the maximum water supply.

The reliable system source capacity is valuable in determining future water capacities of the particular community water system sources (wells, springs, etc.). Although future water projections are not addressed in this study, the data provided here are used in the state water plans which the division is formulating for each major hydrologic basin in the state. These basin plans deal with considerable detail about future water demands and supplies.

The last part of the data collection process is to determine the present water use for each community water system. Present water use, as defined herein, includes the developed water which is actually diverted into the distribution system from surface or subsurface sources. The data collected represents the latest available complete calendar year from when the study is started. Water use is divided into four categories: residential, commercial, institutional and industrial. For comparative purposes the division chose these categories to correlate with the United States Geological Survey's (USGS) categories of domestic, commercial, industrial, and mining. The division's residential category is equivalent to the USGS domestic category and includes water used in residential homes for inside and outside uses. The USGS commercial category is equivalent to the division's combined commercial and institutional categories. The commercial category includes water use for retail establishments and businesses. The institutional category includes water use for government facilities, military facilities, schools, hospitals, churches, parks, cemeteries, golf courses, etc. The division's industrial category is equivalent to the combined USGS categories of industrial and mining which includes a wide variety of water uses associated with businesses that produce a specific product.

Residential Use

From the system operator, the staff collects data about the number of residential connections and the amount of water used by those connections. Water use in this category is divided into three subcategories: culinary-outside, culinary-inside, and secondary-outside use. The first step in calculating the amount of water used in each of these subcategories is determining the amount of outside irrigation. Because very few entities meter outside water use, division staff attempts to determine the acreage that is actually irrigated by homeowners. Average lot size, percent irrigated, percent of residences that are supplied by separate secondary (pressurized and ditch) irrigation systems, water right-duty rates in the area, and other related information are used to estimate outside water use for each entity. Occasionally, delineation between lawns or gardens and farm fields becomes difficult. In these cases, the division's land use mapping program is utilized to take out the areas of the community that have been included as irrigated farmland.

Once residential outside water use is determined, it is subtracted from the given total residential water use. This amount is assumed to be the residential inside water use. When available, indoor water use can be estimated by looking at several residences' winter water bills and meter readings. When either of these methods yield an unreasonable value, then the staff uses a general range of between 75 and 120 gallons per capita per day (gpcd) for inside use and back-calculates outside water use from the total water use given.

Commercial Use

For most systems, the system operator can separate metered commercial water use data from the total water use. In cases where this data is not available or is extremely difficult to obtain, the division staff attempts to estimate commercial water use by inventorying commercial businesses in the area and using published commercial water use estimates. These publications come from the Division of

Drinking Water and from reports published by the Utah State Water Lab. In some rural communities where there is a relatively small number of commercial connections, the businesses are visited by division staff and asked about their water use.

Institutional Use

Institutional water use is water used for city, county, state and federal government facilities, parks, golf courses, schools, hospitals, churches, military facilities, fire hydrant testing and other municipal losses in the water system. Because this water use is rarely metered, the process to acquire this data is a difficult one. Again, the system operator is asked to provide information about city facilities such as number and size of parks, schools, churches, and golf courses. Water right-duty rates for the area are used to calculate the amount of water these areas use. Also, estimates are made of leakage and testing of water system facilities and included in this category.

Industrial Use

Industrial use within community water systems is acquired with the same process used to obtain commercial water use data discussed earlier. Industrial water use is defined as water used in the production of a product. Therefore, such commercial establishments as dairies and mink farms are included in this category, provided a community system serves them.

Present Methodology for Non-Community Water Systems

Division staff attempts to contact each non-community system and make a personal visit. These systems rarely meter their water use, so estimates are made by division staff as to their actual annual water use. Questions are asked to determine type of facility, population served, water source information, irrigation of

outside areas, etc. This data, along with other water -related publications, are used to determine water use. The maximum water supply for these systems is often not available and is not in the scope of this study.

Present Methodology for Self-Supplied Industrial Water Systems

For self-supplied industries, water use is acquired by using data given on the Division of Water Rights Industrial Water Use Form. The Division of Water Rights collects annual water use data from most of the major self-supplied industrial water users in the state. This data is confidential. Therefore, the data presented in this M&I study is only given as county totals. Again, the maximum water supply is often not available and is not in the scope of this study.

Present Methodology for Private Domestic Water Systems

Private domestic systems are residences that are not connected to any public community or non-community water system. They are usually supplied by individual wells. The water use data for this category is acquired by taking the State Office of Budget county population data and subtracting the population served by community water systems. The remainder is the population that is served by private domestic systems. A reasonable per capita rate (usually determined from the residential per capita rates from nearby community systems) is applied to this population to determine the total water use by private domestic systems. Since the maximum water supply for private wells is really an analysis of the total groundwater reservoir/recharge area, it is not in the scope of this study.

DEFINITIONS OF WATER TERMS

Some water terms peculiar to the water industry are briefly defined in order to better understand the information presented.

Water Supply Terms

Water is supplied by a variety of systems for many users. The general term supply is defined as amount of water available. Most water supply systems are owned by a municipality, but in some cases the owner/operator is a private company or is a state or federal agency. Thus, a "public" water supply may be either publicly or privately owned. Also, systems may supply treated or untreated water.

Maximum Water Supply Available Under Present Conditions - The annual volume of water which is the lesser of the hydrologic capacity of the water source, the physical capacity of the water system, or the use allowed by the water right. See Figure 4.

Reliable System Source Capacity - The actual annual quantity of the maximum water supply that is available to meet peak demands. When this number is divided by the average per capita usage, the resulting number represents the maximum population that the water source can serve. See Figure 4.

Municipal Water Supply - A supply that provides potable (culinary) water for residential, commercial, and institutional uses. The terms municipal, community and city are often used interchangeably.

Municipal and Industrial Water Supply - Includes all water (potable and non-potable) supplied for residential, commercial, institutional, light industry, and large self-supplied industries. This supply is available for public community systems, public

non-community (transient and non-transient) system, self-supplied industrial systems, unregulated Indian systems and private wells.

Potable Water Supply - Water meeting all applicable safe drinking water requirements for residential, commercial, institutional and industrial uses. Sometimes referred to as culinary water supply.

Non -Potable Water Supply - Water not meeting safe drinking water requirements. Secondary irrigation companies and self-supplied industries supply this water. Sometimes referred to as non-culinary water supply, but usually referred to as secondary water.

Public Community Water Supply - Includes potable water supplied by either privately or publicly owned community systems which serve at least 15 service connections or 25 individuals occupied year round. Water from public community supplies may be used for residential, commercial, institutional, and industrial purposes. This can include both indoor and outdoor uses.

Public Non-Community Water Supply - Includes potable water supplied by either privately or publicly owned systems of two types; transient and non-transient. Transient systems are systems that do not serve 25 of the same non-resident persons per day for more than six months per year. Examples include campgrounds, RV parks, restaurants, convenience stores, etc. Non-transient systems are systems that regularly serve 25 of the same non-resident persons per day for more than six months per year. Examples include churches, schools and industries. This report combines transient and non-transient systems together and calls them all public non-community systems. Industries are reported under self-supplied industries.

Secondary Water Supply - Pressurized or open ditch water supply systems that supply untreated water for irrigation of privately and publicly owned lawns, gardens, parks, cemeteries, golf courses and other open areas. These systems, sometimes called "dual" water systems, are installed to provide an alternative to irrigating with culinary water for these outdoor areas. This supply is often provided by irrigation companies. Self-supplied industries can also use secondary water for industrial processes.

Self-supplied Industrial Supply - Includes potable or non-potable water supplied by individual privately owned industries usually from their own wells or springs.

Water Use Terms

Water is used in a variety of ways and for many purposes. Water is often said to be "used" when it is diverted, demanded, withdrawn, depleted or consumed. But it is also "used" in place for such things as fish and wildlife habitat, recreation and hydropower production. The word *use* can be inserted where the word *supply* is written in most of the previous water supply terms to define the current demand associated with those definitions. Some additional water use terms are as follows:

Commercial Use - Uses normally associated with small business operations which may include drinking water, food preparation, personal sanitation, facility cleaning and maintenance and irrigation of facility landscapes. Retail businesses, restaurants and hotels are some examples.

Industrial Use - Uses associated with the manufacturing or production of products. The volume of water used by industrial businesses can be considerably greater than water used by commercial businesses. Manufacturing plants, oil and gas producers, mining companies, mink farms and dairies are some examples.

Institutional Use - Uses normally associated with general operation of various public agencies and institutions including drinking water, personal sanitation, facility cleaning and maintenance and irrigation of parks, cemeteries, playgrounds, recreational areas, golf courses, and other facilities. Many times the amount used by cities for outside irrigation of public areas is not metered.

Municipal and Industrial (M&I) Use - Term includes all residential, commercial, institutional, and industrial uses. It includes total uses (potable and non-potable) supplied by public water systems (community and non-community), self-supplied industries, private domestic systems, and secondary irrigation companies.

Private-Domestic Use - Includes water from private wells or springs for use in individual homes, usually in rural areas not accessible to public water supply systems.

Residential Use - Water use associated with residential cooking; drinking water; washing clothes; miscellaneous cleaning; personal grooming and sanitation; irrigation of lawns, gardens and landscapes, and washing automobiles, driveways and other outside facilities. Single family homes, apartments, duplexes and condominiums are some examples.

Other Water Terms

Consumption - Water evaporated, transpired or irreversibly bound in either a physical, chemical or biological process.

Consumptive Use - Losses of water brought about by human endeavors when used for residential, commercial, institutional, industrial, agricultural, power generation, and recreation. Naturally occurring vegetation and fish and wildlife also consumptively use water.

Depletion - Water lost or made unavailable for return to a given designated area, river system or basin. It is intended to represent the net loss to a system. The terms consumption and depletion are often used interchangeably but are not the same. For example, water exported from a basin is depletion to the basin system but is not consumed in the basin. The exported water is available for use in another system. Water diverted to irrigated crops in a given system, but not returned for later use, is depletion. Precipitation that falls on irrigated crops is not considered a part of the supply like surface water and groundwater diversions. For this reason, precipitation falling on and consumed by irrigated crops is not considered as being a depletion to the system.

Diversion - Water diverted from supply sources such as streams, lakes, reservoirs or groundwater for a variety of uses including cropland irrigation, residential, commercial, institutional and industrial. The terms diversion and withdrawal are often used interchangeably.

Withdrawal - Water withdrawn from supply sources such as lakes, streams, reservoirs or groundwater. This term is normally used in association with groundwater withdrawal.

WATER RIGHTS IN THE GREAT SALT LAKE DESERT BASIN

Although a detailed analysis of water rights is not part of this report, a water supply and use study would not be complete without a discussion on the current water right regulations in the area. The following discussion was obtained from the Division of Water Rights, Logan area, Weber river area and the Cedar area offices. It explains the current general water right regulations in the Great Salt Lake Desert Basin with regards to M&I uses.

Beaver and Iron Counties

Pine Valley and Hamblin Valley are open to underground water applications of 2 acre-feet or less. Surface waters are open through change of application only.

Box Elder County

The Columbia Basin portion of Box Elder County is closed to all surface waters. Underground water is open to any new domestic filings. The Great Salt Lake Desert portion of Box Elder County is closed to all surface waters. Underground domestic filings are limited to one family, 0.25 acres of irrigation and 10 head of livestock. Larger filings are being reviewed on an individual basis.

Juab and Millard Counties

This area is open to surface and underground water filings but reviewed for possible interference with existing rights.

Tooele County

Tooele valley is closed to all new appropriations. Rush Valley is open but limited to 0.1 cubic feet per second or 24 acre-feet per year.

The remainder of the county is open to surface appropriations if sources are adequate in supply and quality. Underground water filings are open but reviewed for interference with existing rights.

BOX ELDER COUNTY M&I WATER SUPPLIES AND USES

The Great Salt Lake Desert Basin portion of Box Elder County claims Snowville as it's only incorporated community. Within this area are 3 public community systems, 5 public non-community systems, and one self-supplied industry. Figure 3 contains locations of the public community systems. Box Elder County also claims the entire Utah portion of the Columbia basin. Only private domestic M&I use occurs in this basin. These uses have been tabulated in the following tables. Further reference to the Columbia basin is avoided for brevity and to avoid confusion.

Table 1 shows that the maximum annual water supply for public community systems in this portion of Box Elder County is about 968 acre-feet; 116 from springs and 852 from wells. Reliable system source capacity is less than half that amount at 412 acre-feet.

TABLE 1
BOX ELDER COUNTY
Potable Water Supplies for Public Community Systems

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
BOX ELDER COUNTY				
Grouse Creek	96.8	80.7	0.0	177.5
Howell Town Water Department	19.3	270.7	0.0	290.0
Snowville Waterworks Incorporated	0.0	500.0	0.0	500.0
BOX ELDER COUNTY TOTALS	116.1	851.4	0.0	967.5

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 2 shows the reliable system source capacity along with a breakdown of potable water use for each public community system. This table shows that for this portion of Box Elder County the current annual use is about 57 percent of the reliable supply at 234 acre-feet.

Secondary water is another important aspect of total M&I use. Table 3 gives the amount of secondary water used for various categories within the boundaries of

TABLE 2
BOX ELDER COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
BOX ELDER COUNTY															
Grouse Creek	11.9	16.0	0.1	1.1	4.4	33.5	75	0.447	398.7	178	2.3761	0.1585	0.0711	0.0874	75
Howell Town Water Department	16.8	24.7	0.0	0.0	0.0	41.5	200	0.208	185.2	290	2.2333	0.2589	0.0827	0.1761	130
Snowville Waterworks Incorporated	37.1	71.1	27.8	7.2	16.1	159.3	250	0.637	568.8	500	2.4132	0.4463	0.3432	0.1032	207
										see note					
BOX ELDER COUNTY TOTALS	**65.8**	**111.8**	**27.9**	**8.3**	**20.5**	**234.3**	**525**	**0.446**	**398.4**	**968**	**2.3760**	**0.8637**	**0.4970**	**0.3667**	**412**
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.
Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K	These values are all input data.
G=B+C+D+E+F	This value represents only Potable M&I Water Use.
IG/H	Average per capita potable water use.
J=I892.682	Converts from Ac-Ft/Yr to GPD
L=(2.5*J-49.4)/J	The factor which when multiplied to the average per capita water use represents water use during peak demands.
M=K*892.682/1000000; (except as provided in the note above)	Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.
N=H*J*L/1000000	Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor
O=M-N	The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.
P={M/(L*J)}*J*1120.22	Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

the public community systems. In this portion of Box Elder County various irrigation companies deliver secondary water to customers. Total secondary use is 23 acre-feet.

TABLE 3
BOX ELDER COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
BOX ELDER COUNTY					
Grouse Creek	0.0	0.0	12.0	0.0	12.0
Howell Town Water Department	0.0	0.0	0.0	0.0	0.0
Snowville Waterworks Incorporated	4.7	0.0	6.0	0.0	10.7
BOX ELDER COUNTY TOTALS	4.7	0.0	18.0	0.0	22.7

Note: Separate irrigation companies provide secondary water to the water supplier unless indicated by an '*'.

Table 4 gives water use for public non-community systems, private domestic systems and self-supplied industries. Thiokol is the only self-supplied industry in this portion of the county. All of these uses amount to 775 acre-feet.

TABLE 4
BOX ELDER COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
BOX ELDER COUNTY						
Golden Spike National Monument	0.0	0.0	1.5	0.0	1.5	0.0
Lakeside Range	1.1	0.0	2.3	0.0	3.4	0.0
Palmer Twin Motel	1.0	2.0	0.0	0.0	3.0	0.0
Park Valley Latter-Day Saint Church	0.0	0.0	4.0	0.0	4.0	0.0
Park Valley School	0.0	0.0	13.0	0.0	13.0	0.0
SELF-SUPPLIED INDUSTRIES *	0.0	0.0	0.0	699.6	699.6	0.0
PRIVATE DOMESTIC	50.0	0.0	0.0	0.0	50.0	0.0
BOX ELDER COUNTY TOTALS	52.1	2.0	20.8	699.6	774.5	0.0

*SELF-SUPPLIED INDUSTRIES:
Thiokol

Total potable M&I water use in the county is 1,009 acre-feet, while secondary use is 23 acre-feet; giving a total M&I water use of 1,032 acre-feet. Since the current population of this portion of Box Elder County is about 725 the total M&I per capita use is 1,271 gpcd. Thiokol's water use is the reason for such a high per capita rate. Table 5 gives various per capita rates for public community systems. Appendix A shows supporting data for the public community system that is presented in the tables.

TABLE 5
BOX ELDER COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.338	302
Residential Potable Plus Secondary Use	0.347	310
Total Potable Use	0.446	398
Total Potable Plus Secondary Use	0.490	437

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

JUAB COUNTY M&I WATER SUPPLIES AND USES

The Great Salt Lake Desert Basin portion of Juab County has no incorporated communities. Within this area is 1 unregulated Indian system, 1 public non-community system, and no self-supplied industries. Location of the public community systems are shown back in figure 3.

Table 6 shows that the maximum annual water supply for public community systems in Juab County is 15 acre-feet; all from wells. Reliable system source capacity is nearly that amount at 13 acre-feet.

TABLE 6
JUAB COUNTY
Potable Water Supplies for Public Community Systems

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
JUAB COUNTY				
Goshute Indian Reservation	0.0	15.0	0.0	15.0
JUAB COUNTY TOTALS	0.0	15.0	0.0	15.0

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 7 shows the reliable system source capacity along with a breakdown of the potable water use for each public community system. This table shows that for Juab County the current annual potable use is equal to the reliable system source capacity at 13 acre-feet. Secondary water is not used in this portion of Juab County.

Table 8 gives annual water use for public non-community systems and private domestic systems. There are no self-supplied industries in this portion of Juab County. The West Desert School is the only listed non-community system. There are a few residences that use their own wells. All of these uses amount to 24 acre-feet.

TABLE 7
JUAB COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
JUAB COUNTY															
Goshute Indian Reservation	12.4	0.0	0.0	0.5	0.0	12.9	111	0.116	103.7	15	2.0238	0.0233	0.0233 *	0.0000	13
										see note					
JUAB COUNTY TOTALS	**12.4**	**0.0**	**0.0**	**0.5**	**0.0**	**12.9**	**111**	**0.116**	**103.7**	**15**	**2.0238**	**0.0134**	**0.0233**	**0.0000**	**13**
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.
Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K	These values are all input data.
G=B+C+D+E+F	This value represents only Potable M&I Water Use.
I=G/H	Average per capita potable water use.
J=I*892.682	Converts from Ac-Ft/Yr to GPD
L=(2.5*J-49.4)/J	The factor which when multiplied to the average per capita water use represents water use during peak demands.
M=K*892.682/1000000; (except as provided in the note above)	Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.
N=H*J*L/1000000	Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor
O=M-N	The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.
P={M/(L*J)}*J*1120.22	Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

TABLE 8
JUAB COUNTY
Water Use for Public Non-Community Systems, Self-Supplied Industries and Private Domestic Systems

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
JUAB COUNTY						
West Desert School	0.0	0.0	3.5	0.0	3.5	0.0
SELF-SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC	20.0	0.0	0.0	0.0	20.0	0.0
JUAB COUNTY TOTALS	20.0	0.0	3.5	0.0	23.5	0.0

Total M&I water use in the county is 36 acre-feet. Since the current population of this portion of Juab County is about 191 the total M&I per capita use is 173 gpcd. Table 9 gives various per capita rates for the lone public community system. Appendix B shows the data for each public community system that is presented in the tables.

TABLE 9
JUAB COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.112	100
Residential Potable Plus Secondary Use	0.112	100
Total Potable Use	0.116	104
Total Potable Plus Secondary Use	0.116	104

Note: Total Potable categories include residential, commercial, institiutional and industrial uses.

MILLARD COUNTY M&I WATER SUPPLIES AND USES

The Great Salt Lake Desert Basin portion of Millard County has no incorporated communities. Within this area is 1 public community system and no public non-community systems. Location of the public community system is shown back in figure 3.

Table 10 shows that the maximum annual water supply for the public community system in this portion of Millard County is 323 acre-feet; all from wells. Reliable system source capacity is less than half that amount at 137 acre-feet.

TABLE 10
MILLARD COUNTY
Potable Water Supplies for Public Community Systems

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
MILLARD COUNTY				
Eskdale	0.0	322.6	0.0	322.6
MILLARD COUNTY TOTALS	0.0	322.6	0.0	322.6

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 11 shows the reliable system source capacity along with a breakdown of the potable water use for the system. This table shows that for this portion of Millard County the current annual potable use is less than one half the reliable supply at 33 acre-feet. Secondary water is not used at all in this portion of Millard County.

Table 12 gives water use for private domestic systems. There are no self-supplied industries and only a handful of private domestic wells. All of these uses amount to only 15 acre-feet.

TABLE 11
MILLARD COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
MILLARD COUNTY															
Eskdale	9.9	15.2	0.3	7.4	0.4	33.2	85	0.391	348.7	323	2.3583	0.2880	0.0699	0.2181	137
										see note					
MILLARD COUNTY TOTALS	**9.9**	**15.2**	**0.3**	**7.4**	**0.4**	**33.2**	**85**	**0.391**	**348.7**	**323**	**2.3583**	**0.2880**	**0.0699**	**0.2181**	**137**
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.
Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K	These values are all input data.
G=B+C+D+E+F	This value represents only Potable M&I Water Use.
I=G/H	Average per capita potable water use.
J=I*892.682	Converts from Ac-Ft/Yr to GPD
L=(2.5*J-49.4)/J	The factor which when multiplied to the average per capita water use represents water use during peak demands.
M=K*892.682/1000000; (except as provided in the note above)	Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.
N=H*J*L/1000000	Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor
O=M-N	The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.
P={M/(L*J)}*J*1120.22	Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

TABLE 12
MILLARD COUNTY
Water Use for Public Non-Community Systems, Self-Supplied Industries and Private Domestic Systems

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
MILLARD COUNTY						
SELF-SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC	15.0	0.0	0.0	0.0	15.0	0.0
MILLARD COUNTY TOTALS	15.0	0.0	0.0	0.0	15.0	0.0

Total M&I water use in the county is 48 acre-feet. Since the current population of this portion of Kane County is about 145 the total M&I per capita use in Kane County is 296 gpcd. Table 13 gives various per capita rates for public community systems. Appendix C shows the supporting data for the one public community system that is presented in the tables.

TABLE 13
MILLARD COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.295	264
Residential Potable Plus Secondary Use	0.295	264
Total Potable Use	0.391	349
Total Potable Plus Secondary Use	0.391	349

Note: Total Potable categories include residential, commercial, institiutional and industrial uses.

TOOELE COUNTY M&I WATER SUPPLIES AND USES

The Great Salt Lake Desert Basin portion of Tooele County includes the incorporated communities of Grantsville, Ophir, Rush Valley, Stockton, Tooele, Vernon and Wendover. Within this area are 13 public community systems, 12 public non-community systems, and 9 self-supplied industries. Location of the public community systems are shown back in figure 3. One public community system is run by Tooele Army Depot which delivers water to their North Area. Rush Valley is the only incorporated community without a public community system.

Table 14 shows that the maximum annual water supply for public community systems in Tooele County is 24,523 acre-feet; 5,291 acre-feet from springs 19,232 acre-feet from wells. Reliable system source capacity is 11,627 acre-feet.

TABLE 14
TOOELE COUNTY
Potable Water Supplies for Public Community Systems

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
TOOELE COUNTY				
Dugway - English Village	0.0	3,359.4	0.0	3,359.4
Erda Acres Water Company	0.0	847.0	0.0	847.0
Golden Gardens	0.0	104.8	0.0	104.8
Grantsville Municipal Water System	0.0	3,708.7	0.0	3,708.7
Lincoln Culinary Water	84.4	54.5	0.0	138.9
Ophir Canyon Water Association	61.3	49.8	0.0	111.1
S and W Trailer Park	0.0	24.6	0.0	24.6
Stansbury Park Improvement District	0.0	4,238.8	0.0	4,238.8
Stockton Municipal Water System	395.1	104.8	0.0	499.9
Tooele Army Depot (North)	0.0	2,708.2	0.0	2,708.2
Tooele Municipal Water System	1,201.7	3,923.3	0.0	5,125.0
Vernon Water Works	0.0	108.1	0.0	108.1
Wendover Municipal Water System	3,548.6	0.0	0.0	3,548.6
TOOELE COUNTY TOTALS	5,291.1	19,232.0	0.0	24,523.1

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 15 shows the reliable system source capacity along with a breakdown of the potable water use by public community systems. This table shows that for

TABLE 15
TOOELE COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
TOOELE COUNTY															
Dugway - English Village	122.1	63.8	0.0	609.0	0.0	794.9	1,090	0.729	651.0	3,359	2.4241	2.9989	1.7201	1.2787	1,386
Erda Acres Water Company	26.0	26.9	0.0	0.0	0.0	52.9	278	0.190	169.9	847	2.2092	0.7561	0.1043	0.6518	383
Golden Gardens	11.2	10.9	0.0	0.0	0.0	22.1	140	0.158	140.9	105	2.1494	0.0936	0.0424	0.0511	49
Grantsville Municipal Water System	674.0	290.7	75.7	78.5	43.3	1,162.2	5,000	0.232	207.5	3,709	2.2619	3.3107	2.3467	0.9640	1,640
Lincoln Culinary Water	48.7	18.8	0.0	10.6	0.0	78.1	400	0.195	174.3	139	2.2166	0.1545	0.1545 *	0.0000	78
Ophir Canyon Water Association	17.5	5.3	0.0	9.0	0.0	31.8	149	0.213	190.5	111	2.2407	0.0992	0.0636	0.0356	50
S and W Trailer Park	12.5	3.0	0.4	0.0	0.0	15.9	200	0.080	71.0	25	1.8039	0.0256	0.0256 *	0.0000	16
Stansbury Park Improvement District	199.7	215.1	146.8	22.9	3.7	588.2	2,100	0.280	250.0	4,239	2.3024	3.7839	1.2089	2.5750	1,841
Stockton Municipal Water System	182.9	64.1	4.0	4.6	4.6	260.2	450	0.578	516.2	500	2.4043	0.5585	0.5585 *	0.0000	260
Tooele Army Depot (North)	17.0	8.5	0.0	576.4	257.9	859.8	110	7.816	6,977.5	2,708	2.4929	2.4176	1.9134	0.5042	1,086
Tooele Municipal Water System	1,776.3	611.7	149.3	523.7	179.0	3,240.0	17,000	0.191	170.1	5,125	2.2096	6.3909	6.3909 *	0.0000	3,240
Vernon Water Works	24.8	16.5	0.1	23.0	0.0	64.4	200	0.322	287.4	108	2.3281	0.1338	0.1338 *	0.0000	64
Wendover Municipal Water System	248.3	64.0	112.5	43.1	7.9	475.8	1,600	0.297	265.5	3,549	2.3139	3.1678	0.9828	2.1850	1,534
										see note					
TOOELE COUNTY TOTALS	**3,361.0**	**1,399.3**	**488.8**	**1,900.8**	**496.4**	**7,646.3**	**28,717**	**0.266**	**237.7**	**24,523**	**2.2922**	**23.8910**	**15.6457**	**8.2453**	**11627**
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.
Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K	These values are all input data.
G=B+C+D+E+F	This value represents only Potable M&I Water Use.
I=G/H	Average per capita potable water use.
J=I*892.682	Converts from Ac-Ft/Yr to GPD
L=(2.5*J-49.4)/J	The factor which when multiplied to the average per capita water use represents water use during peak demands.
M=K*892.682/1000000; (except as provided in the note above)	Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.
N=H*J*L/1000000	Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor
O=M-N	The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.
P={M/(L*J)}*J*1120.22	Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

Tooele County the current annual potable use is about 65 percent of the reliable supply at 7,646 acre-feet.

Secondary water is another important aspect of total M&I use. Table 16 gives the amount of secondary water used for various categories within the boundaries of the public community systems. In Tooele County seven community systems use secondary water: Dugway-English Village, Golden Gardens, Grantsville, Lincoln, Stansbury Park, Tooele and Vernon. Total secondary use is 1,397 acre-feet.

TABLE 16
TOOELE COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
TOOELE COUNTY					
Dugway - English Village*	0.0	0.0	1,005.0	0.0	1,005.0
Erda Acres Water Company	0.0	0.0	0.0	0.0	0.0
Golden Gardens	8.0	0.0	0.0	0.0	8.0
Grantsville Municipal Water System	142.1	0.0	0.0	0.0	142.1
Lincoln Culinary Water	1.6	0.0	0.0	0.0	1.6
Ophir Canyon Water Association	0.0	0.0	0.0	0.0	0.0
S and W Trailer Park	0.0	0.0	0.0	0.0	0.0
Stansbury Park Improvement District	0.0	0.0	88.0	0.0	88.0
Stockton Municipal Water System	0.0	0.0	0.0	0.0	0.0
Tooele Army Depot (North)	0.0	0.0	0.0	0.0	0.0
Tooele Municipal Water System	149.5	0.0	0.0	0.0	149.5
Vernon Water Works	2.4	0.0	0.0	0.0	2.4
Wendover Municipal Water System	0.0	0.0	0.0	0.0	0.0
TOOELE COUNTY TOTALS	303.6	0.0	1,093.0	0.0	1,396.6

Table 17 gives water use for public non-community systems, self-supplied industries, and private domestic systems. Several churches as well as the South Area of Tooele Army Depot are among the 12 listed non-community systems. Aptus, Barrick Resources (USA) Inc., Cargill Salt Inc., Chemical Lime Co., Envirocare of Utah Inc., Laidlaw Environmental, Magnesium Corporation of America, Morton International and Reilly Industries are the 9 listed self-supplied industries. There are numerous residences using their own wells. All of these uses amount to 13,960 acre-feet of potable use and 170,964 acre-feet of non-potable use (Saline water accounts for 170,961 acre-feet of this value) for a total of 184,924 acre-feet.

TABLE 17
TOOELE COUNTY
Water Use for Public Non-Community Systems, Self-Supplied Industries and Private Domestic Systems

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
TOOELE COUNTY						
Delle Auto/Truck Stop	0.0	3.0	0.0	0.0	3.0	0.0
Dugway - Carr Facility	0.0	0.0	13.8	0.0	13.8	0.0
Dugway - Ditto Tech Center	0.0	0.0	143.9	0.0	143.9	0.0
Dugway Ward	0.0	0.0	5.5	0.0	5.5	0.0
Erda Ward	0.0	0.0	2.5	0.0	2.5	0.0
Ibapah Latter-Day Saint Church	0.0	0.0	2.5	0.0	2.5	0.0
Ibapah School	0.0	0.0	2.5	0.0	2.5	0.0
Lakepoint Ward	0.0	0.0	2.5	0.0	2.5	0.0
Motor Vu Theatre	0.0	3.0	0.0	0.0	3.0	0.0
Rush Valley Latter-Day Saint Church	0.0	0.0	2.5	0.0	2.5	0.0
Salt Flats Highway Rest Stop	0.0	0.0	3.0	0.0	3.0	0.0
Tooele Army Depot (South)	0.0	0.0	69.1	207.3	276.4	3.0
SELF-SUPPLIED INDUSTRIES	0.0	0.0	0.0	13,059.1	13,059.1	170,961.2
PRIVATE DOMESTIC	440.0	0.0	0.0	0.0	440.0	0.0
TOOELE COUNTY TOTALS	440.0	6.0	247.8	13,266.4	13,960.2	170,964.2

*SELF-SUPPLIED INDUSTRIES: Aptus, Barrick Resources (USA), Incorporated, Cargill Salt, Incorporated, Chemical Lime Company, Envirocare of Utah, Incorporated, Laidlaw Environmental, Magnesium Corporation of America, Morton International and Reilly Industries - Wendover

Total potable M&I water use in the county is 21,606 acre-feet, while secondary use is 172,361 acre-feet; giving a total M&I water use of 193,967 acre-feet. Since the 1996 population of Tooele County is about 30,479 the total M&I per capita use is 5,632 gpcd. This value is extremely large due to the enormous volume of saline water used exclusively for industrial purpose near Great Salt Lake. By subtracting the 170,961 acre-feet of saline water, total M&I water use becomes 23,006 acre-feet. This value corresponds to 674 gpcd.

Table 18 gives various per capita rates for public community systems. Appendix D shows the data for each public community system that is presented in the tables.

TABLE 18
TOOELE COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.166	148
Residential Potable Plus Secondary Use	0.176	157
Total Potable Use	0.266	238
Total Potable Plus Secondary Use	0.315	281

Note: Total Potable categories include residential, commercial, institiutional and industrial uses.